



PTO 21 2005



10/528678

PCT/IB 03/03897

05.09.03

IB03/03897



INVESTOR IN PEOPLE

MAILED 19 SEP 2003	
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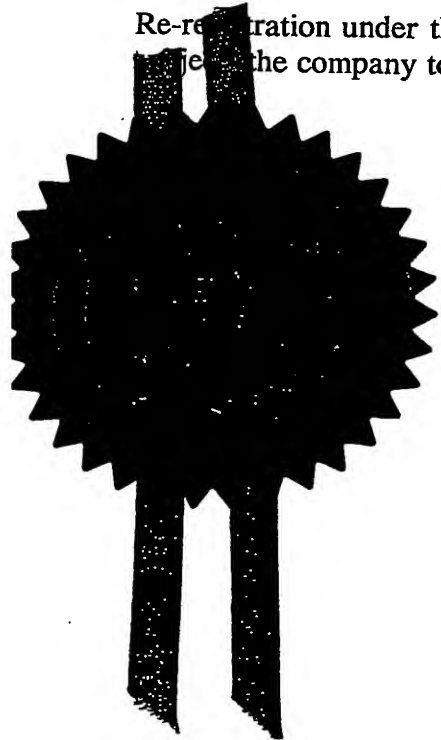
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0222113.3

245EP02 E750481-2 D02879
P01/7700 0.00-0222113.3

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5621 BA EINDHOVEN
THE NETHERLANDS

Patents ADP Number (if you know it)

7419294501

If the applicant is a corporate body, give the country/state of its incorporation

THE NETHERLANDS

Title of the invention

IMAGE RECOGNITION

Name of your agent (if you have one)

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Is a statement of inventorship and of right to grant of a patent required in support of this request? (Answer "Yes" if:

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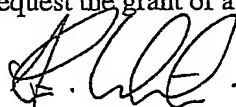
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DESCRIPTION

IMAGE RECOGNITION

5 The present invention relates to image recognition systems, and in particular to systems adapted to provide matching of an electronically captured facial image with images in a database.

10 A number of facial recognition systems are known in the art. For example, US 5,991,429 describes a facial recognition system in which images of individuals given security clearance access are stored on a database. Surveillance cameras are able to compare captured images with those in the database to verify security clearance of a target person.

15 US 6,038,333 describes a recognition system suitable for integration into a portable device such as a PDA, having a camera and a display screen. Face feature information from a captured image is compared with an image database to find similar faces. Personal information relating to the retrieved faces can be displayed in order that a user can recollect previous personal contacts made.

20 US 6,142,876 describes a facial recognition system for tracking players using gaming systems. US 6,035,055 describes a content analyser for determining content data of scanned images used for image comparison without retrieval of pixel data of the stored images. US 6,188,777 describes a system for identifying and tracking a person's image within a moving scene.

25 Generally, interpersonal communication is made possible by the availability of phone numbers, e-mail addresses and other contact information, which are publicised in some way or exchanged between individuals. Conventionally, in a social or business meeting environment, contact information exchange has been verbal, by business card or by other written
30 medium. More recently, personal electronic devices such as PDAs are able to exchange such information using infra-red or other wireless links.

In some circumstances, it may not be possible to achieve the proximity to a person required to request an exchange of contact details. For example, the target person may be occupied in discussion or in some other task. In other circumstances, it may be undesirable to initiate face-to-face contact with a target person until such time as the identity of, or other information about, the target person is known.

It is an object of the present invention to provide a means for obtaining information relating to a person, such as contact details, without face-to-face, verbal or other close contact.

According to one aspect, the present invention provides an apparatus for obtaining personal information related to a target person, comprising:

an image acquisition device for capturing an image of a target person;
a database of stored image data items each relating to one of a plurality of candidate persons, each image data item being associated with stored personal data relating to the respective candidate person;

a search engine for matching the captured image of the target person to a candidate person image data item and retrieving the personal data relating thereto;

an output device for presenting, to a user, the personal data relating to the target person; and

control means, operable by each candidate person, to control third party access to the stored personal data relating to the candidate person.

According to another aspect, the present invention provides a portable device for obtaining personal information related to a target person, comprising:

an image acquisition device for capturing an image of a target person;
means for accessing a remote database of stored image data items each of relating to one of a plurality of candidate persons, each image data item being associated with personal data relating to the respective candidate person;

means for retrieving the personal data relating to a candidate person for which the captured image data of the target person matches the stored image data item of the candidate person;

an output device for presenting, to a user, the retrieved personal data relating to the target person; and

control means to control third party access to the database of personal data relating to a candidate person.

According to another aspect, the present invention provides a system for providing personal information related to a target person, comprising:

a database of stored image data items each relating to one of a plurality of candidate persons, each image data item being associated with personal data relating to the respective candidate person;

means for receiving, from a remote image acquisition device, a captured image of a target person;

a search engine for matching the captured image of the target person to a candidate person image data item and retrieving the personal data relating thereto;

means for transmitting, to a remote output device, the personal data relating to the target person; and

control means, operable by each candidate person, to control third party access to the stored personal data relating to the candidate person.

According to another aspect, the present invention provides a method of obtaining information related to a target person, comprising the steps of:

capturing an image of a target person;

supplying image data from the captured image to a database of stored image data items each relating to one of a plurality of candidate persons, each image data item being associated with personal data relating to the respective candidate person;

searching the database to match the captured image of the target person with a candidate person image data item and retrieving the personal data relating thereto;

outputting the personal data relating to the target person; and

maintaining the database by enabling control, by each candidate person, of third party access to the personal data relating to that candidate person.

These and other aspects of the present invention appear in the appended claims which are incorporated herein by reference and to which the reader is now referred.

Embodiments of the present invention will now be described by way of example only and with reference to the accompanying drawings in which:

Figure 1 shows a schematic block diagram of apparatus for retrieving personal data corresponding to a recognised image, in which a database of image data is distributed across a plurality of participating devices;

Figure 2 shows a schematic block diagram of apparatus for retrieving personal data corresponding to a recognised image, in which a database of image data is centralised for access by a plurality of participating devices; and

Figure 3 shows a schematic block diagram of apparatus for retrieving personal data corresponding to a recognised image, in which a database of image data is centralised for remote access by a plurality of participating devices.

The present invention provides a means for one person (a "participating user") to obtain contact details or other personal information relating to another person (a "target person") using a process of image capture and image matching. Each user of the system provides their image and personal data for storage in a database of images and corresponding personal data (of "candidate persons"), which database is made accessible to participating users.

The expressions "image" or "image data" are used herein to refer to data that is necessary to readily identify and/or distinguish one candidate person from other candidate persons, using an image captured by an appropriate image acquisition device such as a digital camera.

The image data may be stored in a candidate person image database in any appropriate form, to include compressed and uncompressed file formats, raw image data or pre-processed image data, or as essential parametric data derived from raw image data which parametric data is sufficient to facilitate image recognition and matching operations or to assist therein.

With reference to figure 1, a first arrangement of apparatus 10, using a distributed database of image and personal data, is shown.

A first participating user device 11 includes a digital image acquisition device 12, such as a digital camera, for capturing an image of a target person. The user device 11 further includes a communication device 13 for effecting data transfer with other user devices. The communication device may be of any suitable type for the intended use.

For short range use, the communication device 13 may be an infrared or optical transmitter / receiver, or a short range radio device such as that prescribed by the Bluetooth standards. Alternatively, the communication device 13 could be implemented using cellular telephone technology, such as GSM or GPRS.

The user device 11 incorporates a display 14 for displaying at least alphanumeric data, and preferably also graphical data. The user device further includes a memory for storing image data 15 providing an image of the user and personal data 16 relating to the user. The image data 15 may take any of the forms as defined above.

The personal data 16 may include any data that is specific to the user of the device, to include any of such items as name, address, telephone number, fax number, e-mail address, professional information including job title, employer details, membership of professional bodies and/or specialist interest groups, social information such as hobbies, membership of or affiliation with clubs and societies and the like. In a preferred embodiment, the personal data may comprise a standardised format such as that used for V-card business card exchange.

An aspect of the invention is that the user has control over the accessibility to third parties of the user's personal data 16 stored on the user's

device 11. The user of the device 11 is able to insert, edit and restrict the availability of the personal data 16 using a control function 17.

For example, the control function 17 may be used to allow full access to the personal data by third parties, or alternatively to allow only restricted
5 access to portions of the data at any given time. In this way, the personal data may be divided into business and pleasure categories, with the user allowing only third party access to business data during, for example, use in a business environment.

The control function may also be used to restrict access only to certain
10 categories of third party.

The user device also includes a microprocessor 18 for effecting all necessary data processing operations. In preferred embodiments, the user device 11 may be integrated with a personal digital assistant (PDA) type device, a palmtop or laptop computer, a mobile telephone, a personal
15 communicator or other suitable electronic device.

Other participating users of the system each have a respective user device, illustrated as user devices 21 and 31. Each user device 21, 31 is preferably substantially identical to the first user device 11 except, of course, in that there is different respective image and personal data 25, 26, 35, 36 stored
20 therein.

In use, a participating user (at, for example, a business conference) determines that he would like to obtain the contact details of (or even just verify the identity of) a target person in the room. The user points the image acquisition device 12 at the target person and captures an image of the target
25 person. The microprocessor 18 performs any necessary pre-processing of the image, such as framing the necessary facial features and discarding other portions of the captured image that are unnecessary to an image matching process. The pre-processing may also include data compression or determination of essential parametric data from the captured image that will be
30 used in an image comparison operation.

Preferably, the pre-processing operation reduces the quantity of image data necessary for comparison of the image data with a database of candidate person image data items to a bare minimum. This is particularly relevant where only low bandwidth communications channels 40, 41 between devices
5 are available.

After any pre-processing, the captured image data is transmitted to other user devices 21, 31 using the available communications channels 40, 41. Preferably the captured image data is broadcast to all user devices 21, 31 in range of the participating user device 11.

10 In a more sophisticated arrangement, a multi-cast transmission to selected categories of other user devices may be used. For example, the multi-cast address may effectively eliminate transmission to devices already known to the initiating user device (eg. those belonging to members of the same organisation, who are clearly already known to the user). In this way,
15 data transmission overhead may be reduced.

Broadly speaking, the group of other user devices 21, 31 to which the target image data is broadcast or multi-cast effectively defines a database of image data and personal data for each of a plurality of candidate persons. The database is, of course, effectively a distributed database across all the
20 other user devices that are within broadcast range of the user device 11. In a general sense, the database could be even further distributed, in that each user device may either hold the relevant image data and / or personal data, or may merely hold a data reference or pointer to the relevant data at another location, for example, an internet web page address.

25 All user devices 21, 31 receiving the target image transmission then compare the target image data received with their own "candidate" image data 25, 35. If a match is detected, the target user device that detects the match (eg. device 21) then determines whether to transmit the personal data 26 to the user device 11 originating the target image data. This will depend upon
30 the settings applied by the user of device 21, using control function 27. This may also depend upon the identity of the user device 11.

If the control function 27 determines that the personal data 26 may be transmitted to the user device 11, then the personal data is transmitted using the communications channel 40. Upon receipt of the personal data, the user device 11 displays this on display device 14 and/or saves the information to a user address book or other suitable memory location. The user device may alternatively or additionally present the personal data to a user as an audio output, for example, using a voice synthesiser.

Preferably, the display device 14 displays at least alphanumeric personal data. In a further preferred embodiment, the target user device 21 may transmit image data 25 back to the requesting user device 11 which image is displayed on the display 14. This arrangement allows the user of device 11 to verify the returned image against the real life person observed to ensure that the image comparison operation has been correctly executed. In this arrangement, a high resolution, preferably colour display 14 is needed.

This function may be especially useful where the image matching function detects more than one possible match between the target person image data and the candidate person image data items. Where multiple matches occur, each candidate person image (eg. 25, 35) may be displayed on device 11 for verification by the user to decide which is the correct one.

It will be understood that in the arrangement of figure 1, the user device 11 effectively provides an image acquisition device 12 for capturing an image of the target person, a display device 14 for displaying personal data relating to a target person, and control means 17 for controlling access by third parties to the personal data 16 of the participating user stored thereon. A database of stored image data items 25, 35 relating to a plurality of candidate persons and a search engine for matching the captured image to a candidate person image data item is effectively distributed across all of the other user devices 21, 31.

It will be understood that although three user devices 11, 21, 31 are shown, the arrangement is restricted in the number of participating devices only by practical considerations of processing and communications bandwidth.

With reference now to figure 2, an alternative arrangement 110 is now described in which a centralised database 105 of candidate person image data

items and related personal data is provided. In figure 2, reference numerals of parts corresponding to those of figure 1 are numbered accordingly by the addition of one hundred, and need not be separately described.

5 In the arrangement of figure 2, a first participating user device 111 includes a digital image acquisition device 112, such as a digital camera, for capturing an image of a target person. The user device 111 further includes a communication device 113 for effecting data transfer with a central database 105. The communication device may be of any suitable type for the intended use as discussed previously.

10 However, in a preferred arrangement, longer range communication channels are likely and the use of a cellular telephone communication channel is preferred.

The user device 111 also incorporates a display 114 like in the arrangement of figure 1. A significant difference between the figure 2
15 arrangement and that of figure 1 is that image data 115 providing an image of the user, and personal data 116 relating to the user, are not stored on the user device 111, but on the database 105, for all users.

The user device 11 includes control function 117 which is used to upload the user's image data and personal data to the database 105, and to
20 determine third party access rights thereto. The user of the device 111 is therefore able to insert, edit and restrict the availability of the personal data 116 using the control function 117 in similar manner to that described earlier.

The user device also includes a microprocessor 118 for effecting all necessary data processing operations, as discussed above.

25 Other participating users of the system each have a respective user device, illustrated as user devices 121 and 131. Each user device 121, 131 is preferably substantially identical to the first user device 111.

In use, the operation of the arrangement of figure 2 is similar to that of figure 1. The significant difference is that the captured image data of the
30 target is transmitted to the database 105 rather than to other user devices 121, 131. The search is performed by apparatus in communication with the database, which apparatus may be associated with the database.

If a match (e.g. corresponding to the user of device 121) is detected in the database 105, the database determines whether to transmit the personal data 126 to the user device 111 originating the target image data. This will depend upon the third party access settings applied by the user device 121 using control function 127 and possibly also depends on the identity of the user device 111. These access settings may be stored in database 105 but alternatively the database (or the apparatus performing the search) may initiate an enquiry via communications channel 141 to device 121 to determine whether transmission of the personal data 126 to the first user device 111 is permitted.

If third party access rights permit, the personal data 126 is transmitted to the user device 111 using the communications channel 140. Upon receipt of the personal data, the user device 111 displays this on display 114 and/or saves the information to a user address book or other suitable memory location.

It will be understood that in the arrangement of figure 1, the user device 11 effectively provides an image acquisition device for capturing an image of the target person, a display device for displaying personal data relating to a target person, and control means for controlling access by third parties to the personal data of the participating user stored thereon. A database of stored image data items relating to a plurality of candidate persons and a search engine for matching the captured image to a candidate person image data item is effectively provided centrally to all of the other user devices.

With the centralised database system of figure 2, there is not necessarily any enforced proximity of user devices making queries (as there could be by the communication channel in figure 1). Therefore, it may be desirable to impose some geographical limitations on the extent of search. The database 105 may limit the search of candidate image data items to those that relate to user devices clearly in the same geographical area as the participating user device that sends the target image data.

This geographical search limitation can be achieved in a number of ways. Where a cellular telephone communication channel is being used, the

geographical location may be obtained from the operating cells of the relevant devices. Alternatively, each user device may routinely provide a location update to the database according to a GPS fix. Alternatively, a simple user registration procedure may be provided, in which each user attending a conference, for example, may voluntarily enter their location or attendance at the conference. Alternatively, a conference organiser may provide a local database specific to the conference that can be pre-loaded with the relevant image data and / or associated personal data of conference attendees upon registration of the participants.

With reference to figure 3, a modification of the arrangement of figure 2 is illustrated. In this arrangement 210, a centralised database 205 is still accessed by user devices 211, 221, 231. Communication with the database 205 is effected using cellular telephone links 240, 241, 242, which connect the user devices with a network 250, internet gateway 251 and internet 252, to a server 253 coupled to the database 205.

In this arrangement, the server 253 provides the search engine for matching the captured image data of the target person to a candidate person image data item in the database 205.

It will be understood that a large number of image recognition and matching systems are available in the present state of the art, many of which will be suitable for implementation of the systems described herein.

Preferably, the systems described herein can be implemented on existing available hardware, such as PDA type devices or mobile communicators that have the requisite cameras, by providing suitable software for download, possibly over the internet.

Other embodiments are intentionally within the scope of the accompanying claims.

CLAIMS

1. Apparatus for obtaining personal information related to a target person, comprising:

- 5 an image acquisition device for capturing an image of a target person;
 a database of stored image data items each relating to one of a plurality of candidate persons, each image data item being associated with stored personal data relating to the respective candidate person;
 a search engine for matching the captured image of the target person to
10 a candidate person image data item and retrieving the personal data relating thereto;
 an output device for presenting, to a user, the personal data relating to the target person; and
 control means, operable by each candidate person, to control third party
15 access to the stored personal data relating to the candidate person.

2. The apparatus of claim 1 in which the database is a distributed database, candidate persons each having a portable device for storing their own image data items and personal data which may be accessed by the
20 search engine using a wireless communication channel.

3. The apparatus of claim 2 in which the control means comprises an access control function provided on each portable device.

- 25 4. The apparatus of claim 1 in which the database includes a central repository accessible to a plurality of remote portable devices using a wireless communication channel.

5. The apparatus of claim 4 in which the control means is a distributed
30 control means, candidate persons each having a device for storing their own image data items and personal data onto the database and determining third party access rights thereto.
-

6. The apparatus of claim 1 in which the image acquisition device, output device and control means are integrated into a portable electronic device.

5

7. The apparatus of claim 6 in which the portable electronic device is any of a personal digital assistant, personal computer or mobile telephony device.

10

8. The apparatus of claim 6 or claim 7 in which the portable electronic device further includes communication means for communication with a remotely located database and the search engine.

15

9. The apparatus of claim 1 in which the output device is a display device for displaying the personal data relating to the target person.

10. A portable device for obtaining personal information related to a target person, comprising:

20

an image acquisition device for capturing an image of a target person;
means for accessing a remote database of stored image data items each of relating to one of a plurality of candidate persons, each image data item being associated with personal data relating to the respective candidate person;

25

means for retrieving the personal data relating to a candidate person for which the captured image data of the target person matches the stored image data item of the candidate person;

an output device for presenting, to a user, the retrieved personal data relating to the target person; and

30

control means to control third party access to the database of personal data relating to a candidate person.

11. The portable device of claim 10 in which the means for accessing and the means for retrieving include a wireless communication device.

12. The portable device of claim 10 integrated with any of a personal digital assistant, personal computer or mobile telephony device.

13. The portable device of claim 11 in which the wireless communication device is adapted to communicate with a plurality of corresponding devices, the corresponding devices together forming the remote database.

14. The portable device of claim 10 in which the output device is a display device for displaying the personal data relating to the target person.

15. A system for providing personal information related to a target person, comprising:

a database of stored image data items each relating to one of a plurality of candidate persons, each image data item being associated with personal data relating to the respective candidate person;

means for receiving, from a remote image acquisition device, a captured image of a target person;

a search engine for matching the captured image of the target person to a candidate person image data item and retrieving the personal data relating thereto;

means for transmitting, to a remote output device, the personal data relating to the target person; and

control means, operable by each candidate person, to control third party access to the stored personal data relating to the candidate person.

16. The system of claim 15 in which the means for receiving and the means for transmitting include a wireless communication link.

17. The system of claim 15 or claim 16 in which the means for receiving and the means for transmitting include an internet connection.

18. A method of obtaining information related to a target person,
5 comprising the steps of:

capturing an image of a target person;

supplying image data from the captured image to a database of stored
image data items each relating to one of a plurality of candidate persons, each
image data item being associated with personal data relating to the respective
10 candidate person;

searching the database to match the captured image of the target
person with a candidate person image data item and retrieving the personal
data relating thereto;

outputting the personal data relating to the target person; and

15 maintaining the database by enabling control, by each candidate
person, of third party access to the personal data relating to that candidate
person.

19. A computer program product, comprising a computer readable
20 medium having thereon computer program code means adapted, when said
program is loaded onto a computing apparatus, to make the computing
apparatus form the device of any one of claims 10 to 14.

20. A computer program, distributable by electronic data transmission,
25 comprising computer program code means adapted, when said program is
loaded onto a computing apparatus, to make the computing apparatus form
the device of any one of claims 10 to 14.

ABSTRACT

IMAGE RECOGNITION

5 A system and method for obtaining information relating to a person, such as contact details, without face-to-face, verbal or other contact. The apparatus uses an image recognition system for obtaining personal information related to a target person, and includes: an image acquisition device for capturing an image of a target person; a database of stored image
10 data items each relating to one of a plurality of candidate persons, each image data item being associated with stored personal data relating to the respective candidate person; a search engine for matching the captured image of the target person to a candidate person image data item and retrieving the personal data relating thereto; a display device for displaying the personal data
15 relating to the target person; and control means, operable by each candidate person, to control third party access to the stored personal data relating to the candidate person.

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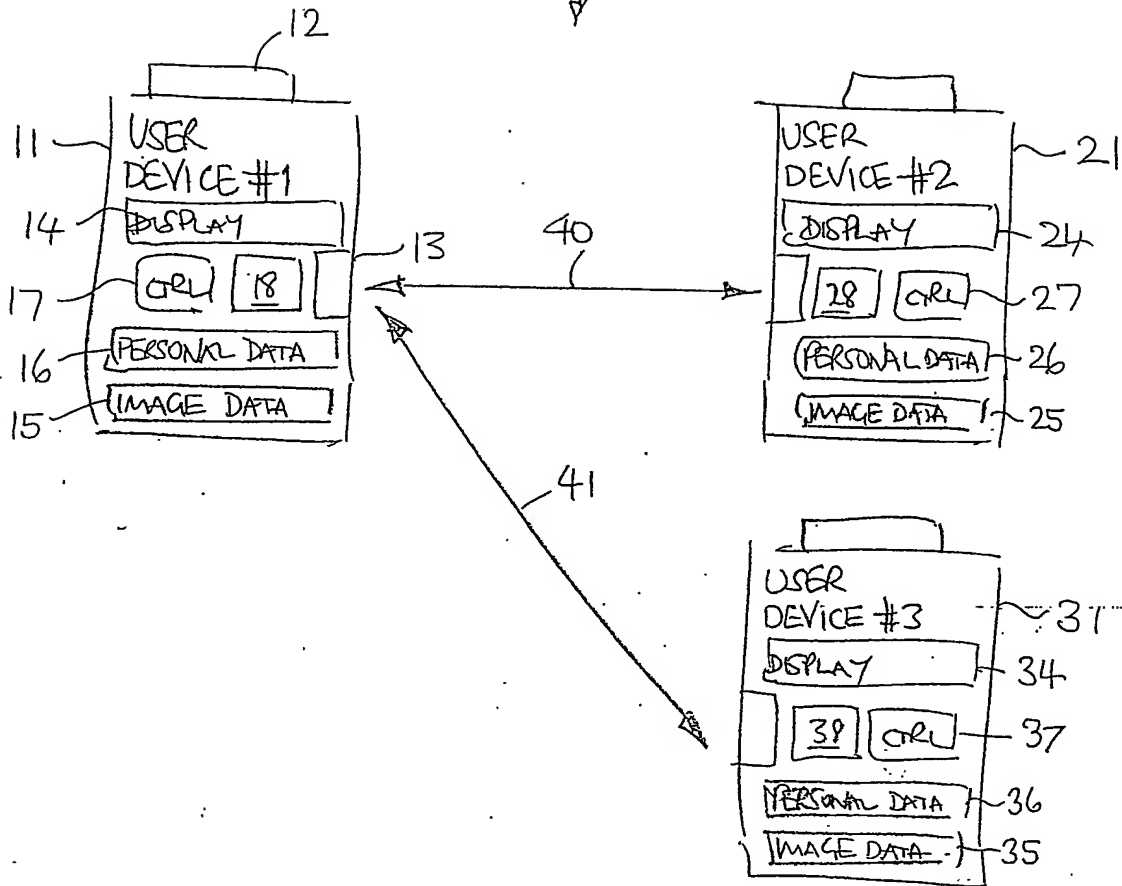
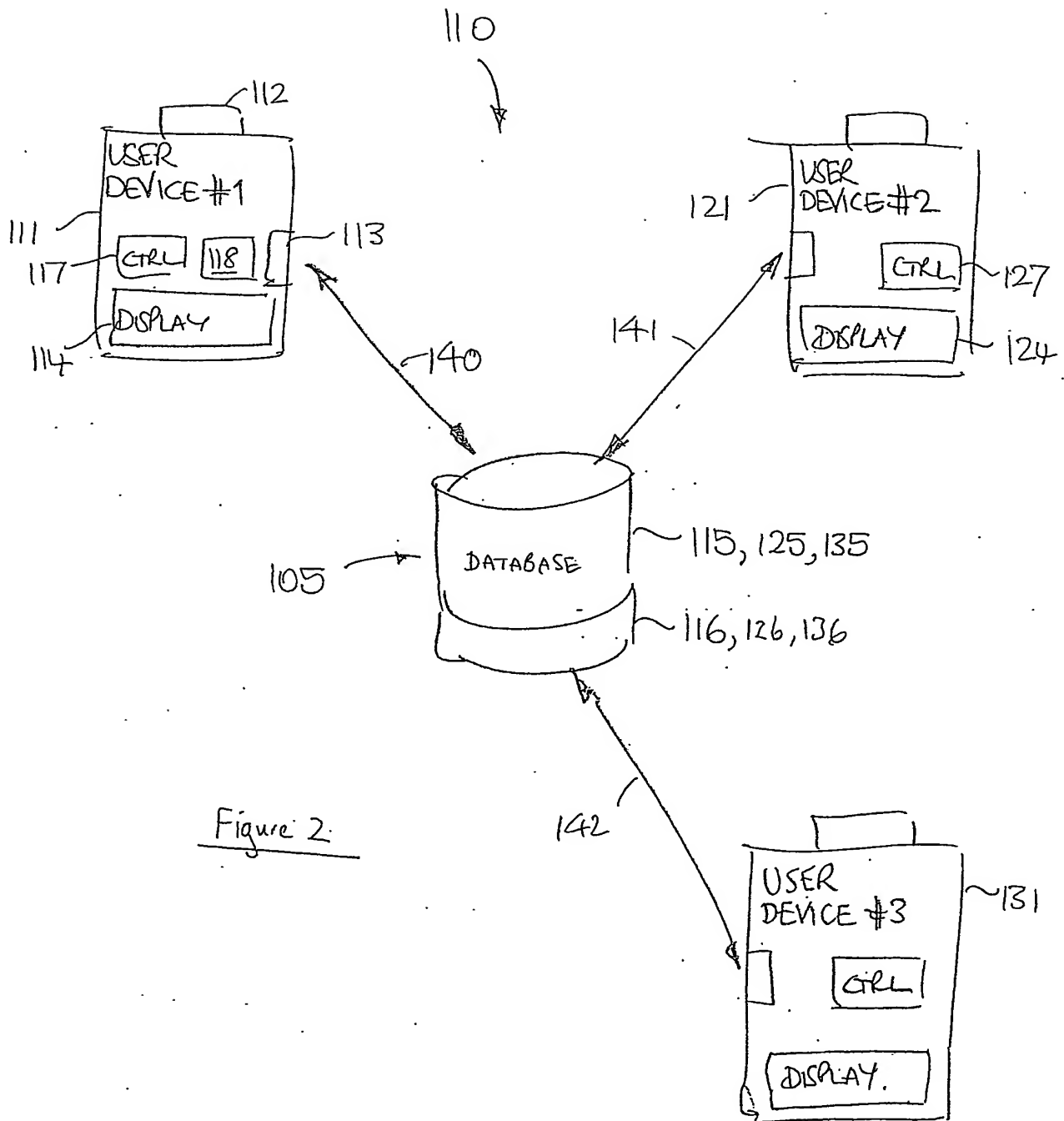


Figure 1

2/3



3/3
210

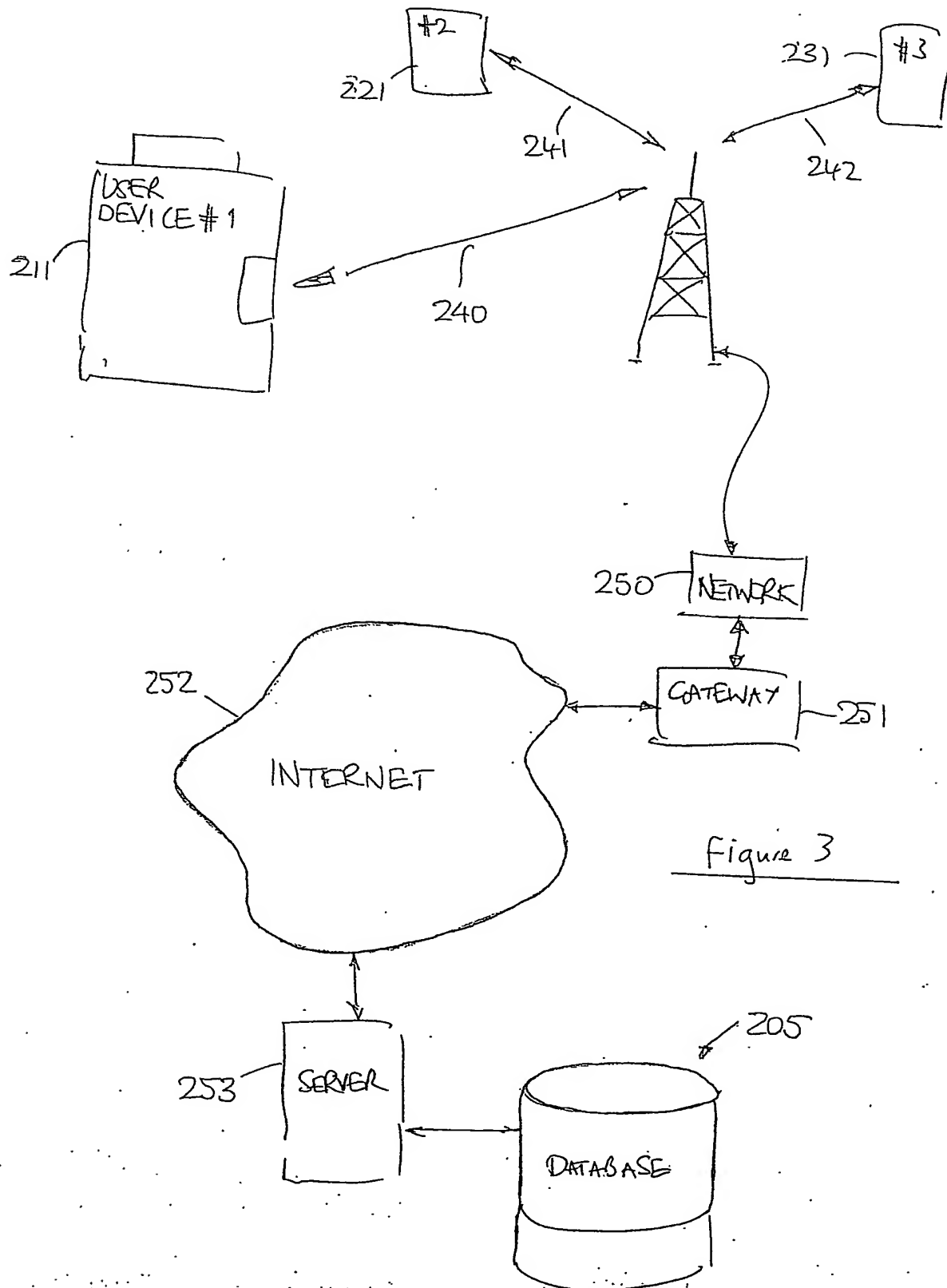


Figure 3